

sensor and upstream from the first product valve and in communication with the controller.

**[0008]** Some embodiments of this aspect of the present invention include one or more of the following: wherein the method further includes the first conductivity sensor determining that the conductivity of product water is not within a first acceptable range and opening the divert valve and maintaining the first product valve and second product valve in a closed position; wherein the method further includes the first conductivity sensor determining that the conductivity of product water is within an acceptable range and opening the first product valve and the second product valve; wherein the method further includes the second conductivity sensor determining the conductivity of the product water and the controller indicating a fault condition when the second conductivity sensor determining that the conductivity of product water is not within a second acceptable range; wherein the method further includes wherein the first acceptable range is lower than the second acceptable range; wherein the method further includes comparing the conductivity from the first conductivity sensor and the second conductivity sensor, and if the conductivity from the first conductivity sensor differs more than a threshold amount from the conductivity of the second conductivity sensor, indicating a fault condition; wherein the method further includes determining that either the first conductivity sensor reading or the second conductivity sensor reading is not within the acceptable range, or threshold range for acceptability, and indicating a fault condition; wherein the method further includes wherein the first conductivity sensor and the second conductivity sensor including three probes connected by a cable, at least one of the three probes comprising a temperature sensor and wherein the resistance between each of the three probes is 500 k Ohms; wherein the method further includes opening a divert valve, receiving a reading from the second conductivity sensor, and indicating a fault condition; wherein the method further includes providing a flow meter downstream from the first product valve and upstream from the second product valve.

**[0009]** In accordance with one aspect of the present invention, a fluid vapor distillation system is disclosed. The system includes a control system for controlling a fluid vapor distillation apparatus including a blow down controller for controlling a blow down valve, a source flow controller for controlling a source flow valve, and a blow down level sensor in communication with a blow down controller and a source flow controller, the blow down level sensor sends signals related to the blow down level to the blow down controller and the source flow controller indicative of the blow down level, wherein the source flow controller actuates the source flow valve based at least on the blow down level sensor signals, and wherein the blow down controller actuates the blow down valve based at least on the blow down level sensor signals, whereby the blow down level and the source flow level are maintained using the blow down level sensor signals as input.

**[0010]** Some embodiments of this aspect of the present invention include one or more of the following: wherein the control system further includes at least one controller, an idle state wherein the at least one controllers are off, a fill state wherein the source valve is opened and source fluid enters a sump in the fluid vapor distillation apparatus, a heat state wherein a heater in the sump is maximized until fluid in the sump reaches a predetermined temperature, a heat

exchanger prime state wherein the source valve is opened to a predetermined duty cycle, a start pump state wherein a bearing feed pump is run at a predetermined speed, and a blow motor is started, and a run state wherein the fluid vapor distillation apparatus produces product water. Also, wherein the system further includes a source fluid input, an evaporator condenser apparatus including a substantially cylindrical housing, and a plurality of tubes in the housing,

whereby the source fluid input is fluidly connected to the evaporator condenser and the evaporator condenser transforms source fluid into steam and transforms compressed steam into product fluid, a heat exchanger fluidly connected to the source fluid input and a product fluid output, the heat exchanger including an outer tube, and at least one inner tube, and a regenerative blower fluidly connected to the evaporator condenser, whereby the regenerative blower compresses steam, and whereby compressed steam flows to the evaporative condenser whereby compressed steam is transformed into product fluid. Wherein the heat exchanger is disposed about the housing of the evaporator condenser. Wherein the heat exchanger further includes wherein the outer tube is a source fluid flow path and the at least one inner tube is a product fluid flow path. Wherein the heat exchanger further includes at least three inner tubes. Wherein the at least three inner tubes are twined to form a substantially helical shape. Wherein the heat exchanger further includes two ends, and at each end a connector is attached, whereby the connectors form a connection to the evaporator condenser. Wherein the evaporator condenser tubes further includes packing inside the tubes. Wherein the packing is a rod. Wherein the evaporator condenser further including a steam chest fluidly connected to the plurality of tubes. Wherein the regenerative blower further includes an impeller assembly driven by a magnetic drive coupling. Wherein the control system includes at least two processors, a motor control engine processor and an ARM processor. Wherein the fluid vapor distillation apparatus further includes a conductivity meter and a conductivity cell to determine the conductivity of the product fluid.

**[0011]** In accordance with another aspect of the present invention, a fluid vapor distillation apparatus is disclosed. The apparatus includes a source fluid input, an evaporator condenser apparatus including a substantially cylindrical housing, and a plurality of tubes in the housing, whereby the source fluid input is fluidly connected to the evaporator condenser and the evaporator condenser transforms source fluid into steam and transforms compressed steam into product fluid, a heat exchanger fluidly connected to the source fluid input and a product fluid output, the heat exchanger including an outer tube, and at least one inner tube, and a regenerative blower fluidly connected to the evaporator condenser, whereby the regenerative blower compresses steam, and whereby compressed steam flows to the evaporative condenser whereby compressed steam is transformed into product fluid, also, a control system for controlling the fluid vapor distillation apparatus including a blow down controller for controlling a blow down valve, a source flow controller for controlling a source flow valve, and a blow down level sensor in communication with a blow down controller and a source flow controller, the blow down level sensor sends signals related to the blow down level to the blow down controller and the source flow controller indicative of the blow down level, wherein the source flow controller actuates the source flow valve based at least on the